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# United States Department of Agriculture,

OFFICE OF EXPERIMENT STATIONS,

A. C. TRUE, Director.

## LIST OF PUBLICATIONS OF THE OFFICE OF EXPERIMENT STATIONS ON IRRIGATION AND DRAINAGE.

[Corrected to June 30, 1905.]

### FOR GRATUITOUS DISTRIBUTION.

[Requests for these publications should be sent to the Secretary of Agriculture or to a Senator or Representative in Congress.]

#### FARMERS' BULLETINS.

Farmers' Bulletin No. 46.—Irrigation in Humid Climates. By F. H. King, Professor of Agricultural Physics, College of Agriculture, University of Wisconsin, and Physicist of the Wisconsin Agricultural Experiment Station. Pp. 27, figs. 4.

Treats of the necessity, advantages, and methods of supplemental irrigation in humid regions.

Farmers' Bulletin No. 138.—Irrigation in Field and Garden. By E. J. Wickson, M. A. Pp. 40, figs. 18.

This bulletin discusses the subject from the standpoint of the individual farmer, and contains instructions on the determination of ditch levels, the measurement of small streams, sources of water supply and their use; the distribution of irrigation water; methods of applying water; the choice of an irrigation method; and the time for the application of water.

Farmers' Bulletin No. 158.—How to Build Small Irrigation Ditches. By C. T. Johnston and J. D. Stannard, Assistants in Irrigation Investigations, Office of Experiment Stations. Pp. 28, figs. 9.

This is a reprint of an article in the Yearbook of the Department of Agriculture for 1900, entitled "Practical Irrigation," giving methods for laying out and building small irrigating ditches, using only such implements as are found on most farms or can easily be made by the farmer.

Farmers' Bulletin No. 187.—Drainage of Farm Lands. By C. G. Elliott, Drainage Expert, Irrigation Investigations, Office of Experiment Stations. Pp. 40, figs. 19.

Explains the effects and advantages of drainage and describes implements and methods suited to a variety of conditions in humid and irrigated regions.

#### CIRCULARS.

Circular No. 50.—Preliminary Plans and Estimates for Drainage of Fresno District, California. By C. G. Elliott, Agent and Expert, Irrigation Investigations, Office of Experiment Stations. Pp. 9.

Circular No. 59.—Progress Report of Cooperative Investigations in California. Pp. 23.

The work of which this is a report included studies of duty of water, evaporation, methods of applying water, pumping water for irrigation, and laboratory tests of pumps. The full report is contained in Bulletin No. 158, noted below.

Circular No. 63.—The Work of the Office of Experiment Stations in Irrigation and Drainage. Pp. 31.

This is the testimony of A. C. True, Director of the Office of Experiment Stations, and of Elwood Mead, Chief of Irrigation and Drainage Investigations of the Office, before the Committee on Irrigation of Arid Lands of the U. S. House of Representatives, at a hearing held February 11, 1905. It is a general statement of the work done by the Office, both as to its character and location.

#### SEPARATES.

Some Engineering Features of Drainage. By C. G. Elliott, Drainage Expert. Pp. 231-244, pl. 1, figs. 2. (Reprint from Yearbook, 1902.)

This is a brief discussion of some general features of drainage and a description of some drainage works near Greeley, Colo.

Preparing Land for Irrigation. By R. P. Teele. Pp. 239-250, pls. 2, figs. 5. (Reprint from Yearbook, 1903.)

Discusses implements, methods, and cost.

Potato Culture near Greeley, Colorado. By J. Max Clark. Pp. 311-322, figs. 6. (Reprint from Yearbook, 1904.)

The Scope and Purpose of the Irrigation Investigations of the Office of Experiment Stations. By Elwood Mead, Irrigation Expert in Charge. Pp. iv, 417-437, pls. 4. (Reprint from Annual Report of Office of Experiment Stations for 1901.)

Review of Irrigation Investigations for 1902. By Elwood Mead, Chief of Irrigation Investigations, Office of Experiment Stations. Pp. iv, 359-385, pls. 6. (Reprint from Annual Report of Office of Experiment Stations for 1902.)

Review of Irrigation Investigations for 1903. By Elwood Mead, Chief of Irrigation Investigations, Office of Experiment Stations. Pp. iv, 469-502, pls. 6. (Reprint from Annual Report of Office of Experiment Stations for 1903.)

Report of Irrigation and Drainage Investigations, 1904. By Elwood Mead, Chief. Pp. iv, 425-472. (Reprint from Annual Report of Office of Experiment Stations for 1904.)

Separates from Bulletins 86, 100, 104, 119, 133, and 158 (see pp. 3, 5, 6, 7, 8) are also available for free distribution.

#### MISCELLANEOUS.

Irrigation and Drainage Investigations of the Office of Experiment Stations. By R. P. Teele. Pp. 23, pls. 2, figs. 5.

A general account intended primarily for distribution at the Louisiana Purchase Exposition.

#### FOR SALE.

[To secure these publications, address the Superintendent of Documents, Government Printing Office, Washington, D. C., inclosing price given. Remittances must be made by cash or United States postal order. Postage stamps and checks not accepted.]

Bulletin No. 60.—Abstract of Laws for Acquiring Titles to Water from the Missouri River and Its Tributaries, with the Legal Forms in Use. Compiled by Elwood Mead, State Engineer of Wyoming. Pp. 77. Price 10 cents.

Includes abstracts of laws and legal forms in use in Colorado, Kansas, Montana, Nebraska, South Dakota, Wyoming, and the Northwest Territories of Canada.

Bulletin No. 70.—Water-right Problems of Bear River. By Clarence T. Johnston and Joseph A. Breckons. Pp. 40, pls. 9. Price 15 cents.

Presents some of the water-right complications of interstate streams as illustrated on Bear River. The bulletin discusses the water supply of the river and its diversion, the controversies which have arisen regarding water rights, and the need of uniform laws.

Bulletin No. 92.—The Reservoir System of the Cache la Poudre Valley. By E. S. Nettleton. Pp. 48, pls. 14. Price 15 cents.

A description of the reservoir system of the Cache la Poudre Valley, showing the benefits to be derived from the construction of reservoirs for the storage of water for irrigation.

Bulletin No. 96.—Irrigation Laws of the Northwest Territories of Canada and Wyoming, with Discussions by J. S. Dennis, Deputy Commissioner of Public Works, Canada, and Fred Bond, State Engineer of Wyoming, and J. M. Wilson, Agent and Expert, Irrigation Investigations, Office of Experiment Stations. Pp. 90, frontispiece, pls. 5. Price 10 cents.

Texts of the irrigation laws of the Northwest Territories of Canada and Wyoming, with the regulations, forms, and methods of procedure adopted in the administration of these laws, and a discussion of the principles underlying the laws and methods followed in their enforcement.

Bulletin No. 100.—Report of Irrigation Investigations in California, under the direction of Elwood Mead, Expert in Charge. Including a discussion of the Agricultural Situation in California, by Elwood Mead, and reports by Special Agents and Observers, as follows: The Irrigation Problems of Honey Lake Basin, Cal., by William E. Smythe; Features and Water Rights of Yuba River, Cal., by Marsden Manson; Irrigation Investigations on Cache Creek, by J. M. Wilson; Report on Irrigation Problems in the Salinas Valley, by C. D. Marx; Irrigation from the San Joaquin River, by Frank Soulé; Water Appropriation from Kings River, by C. E. Grunsky; A Study of Water Rights on the Los Angeles River, Cal., by Edward M. Boggs; Problems of Water Storage on Torrential Streams of Southern California as Typified by Sweetwater and San Jacinto Rivers, by James D. Schuyler. Pp. 411, pls. 29, figs. 16. Price: Paper, 90 cents; cloth, \$1.25.

This report deals with investigations carried on during the summer of 1900 in cooperation with the California Water and Forest Association. In addition to a review of the agricultural situation in the State, it presents a comprehensive discussion of the water laws and customs under which irrigation is practiced in California as typified by the conditions in Honey Lake Basin; and on Yuba River, Cache Creek, Salinas River, San Joaquin River, Kings River, Los Angeles River, Sweetwater River, and San Jacinto River. It describes the methods and means by which water is diverted from these streams and used for irrigation, and the indefinite and excessive appropriations of waters and the resulting litigation, and discusses the evils resulting from absence of State control of streams. Separates of the different articles of this report have been printed.

Bulletin No. 118.—Irrigation from Big Thompson River. By John E. Field, Assistant State Engineer of Colorado. Pp. 75, pls. 5, fig. 1. Price 10 cents.

This is a study of the water laws of Colorado as illustrated by irrigation from Big Thompson River. Mr. Field discusses more particularly the "water loaning" law.

Bulletin No. 124.—Report of Irrigation Investigations in Utah, under the direction of Elwood Mead, Chief of Irrigation Investigations, Office of Experiment Stations. Including General Discussion of

Irrigation in Utah, and Irrigation from Jordan River, by R. P. Teele; Irrigation in Utah Lake Drainage System, by A. P. Stover; The Spanish Fork River Irrigation System, by A. F. Doremus; Irrigation in the Weber Valley, by Jay D. Stannard; Agriculture Under Irrigation in the Basin of Virgin River, and Court Adjudications of Water Rights on Sevier River, by Frank Adams; Appropriations of Water from Logan River, by George L. Swendsen. Pp. 330, pls. 19, figs. 2. Price \$1.10.

A detailed study of the irrigation laws, institutions, and practice of Utah.

Bulletin No. 130.—Egyptian Irrigation. By Clarence T. Johnston, Assistant Chief of Irrigation Investigations, Office of Experiment Stations. Pp. 100, pls. 24, figs. 9. Price 30 cents.

This is a study of the irrigation laws and practices in Egypt, made with special reference to suggestions for improvements in American irrigation.

Bulletin No. 131.—Plans of Structures in Use on Irrigation Canals in the United States, prepared under the direction of Elwood Mead, Chief of Irrigation Investigations, Office of Experiment Stations. Pp. 51, pls. 22. Price 60 cents.

This is an album of plans for irrigation structures, designed by leading irrigation engineers of the West, made from drawings exhibited at Paris in 1900 and at Buffalo in 1901.

Bulletin No. 134.—Storage of Water on Cache La Poudre and Big Thompson Rivers. By C. E. Tait, Assistant in Irrigation Investigations, Office of Experiment Stations. Pp. 100, pls. 5, figs. 10. Price 10 cents.

This bulletin gives details of areas, capacities, and construction of reservoirs in northern Colorado, and the profits from their use.

Bulletin No. 140.—Acquisition of Water Rights in the Arkansas Valley, Colorado. By J. S. Greene, ex-State Engineer of Colorado. Pp. 83, pl. 1, fig. 1. Price 5 cents.

This bulletin discusses the water laws of Colorado and the provisions of water-right contracts in relation to the physical conditions of the Arkansas Valley of Colorado. It is intended to give settlers an understanding of the points which should be looked into before they take steps toward acquiring water rights. It is also believed to be of value to students of irrigation institutions.

Bulletin No. 144.—Irrigation in Northern Italy—Part I. By Elwood Mead, Chief of Irrigation Investigations, Office of Experiment Stations. Pp. 100, frontispiece, pls. 17, figs. 14. Price 20 cents.

This is the first of three bulletins to be published giving the results of a study of Italian irrigation practice, laws, and institutions. The study was made solely from the standpoint of getting suggestions for improvements in our American systems, and it was found that we could learn much from Italy. The first bulletin contains reports on irrigation in Lombardy and Piedmont.

Bulletin No. 145.—Preparing Land for Irrigation and Methods of Applying Water. Prepared by the Agents of Irrigation Investigations. Pp. 84, pls. 7, figs. 33. Price 15 cents.

This bulletin gives descriptions of methods of removing sagebrush, of smoothing land, of laying out fields for different systems of applying water, and of the different systems of applying water. The various methods are compared as to cost and efficiency.

Bulletin No. 146.—Current Wheels: Their Use in Lifting Water for Irrigation. Prepared in the Office of Experiment Stations, Irrigation Investigations. Pp. 38, pls. 4, figs. 21. Price 10 cents.

Drawings and photographs of a large number of wheels used for raising

water from streams are given, accompanied by descriptions, statements of cost, and discussions of efficiency. A general discussion of the theory of current wheels is also given.

Bulletin No. 147.—Report on Drainage Investigations in 1903. By C. G. Elliott, Drainage Expert, Irrigation Investigations, Office of Experiment Stations. Pp. 62, pls. 5, figs. 12. Price 10 cents.

This is a report of the work done by Mr. Elliott during the year 1903. It includes discussions of plans for drainage near Fresno, Cal.; in the Yakima and Atanum valleys, Washington; in the Grey Bull Valley, Wyoming; in the Missouri Valley and in Hancock County, Iowa; and of drainage as a preventive of hillside erosion in Georgia.

Bulletin No. 148.—Report on Irrigation Investigations in Humid Sections of the United States in 1903. Under the direction of Elwood Mead, Chief of Irrigation Investigations. Pp. 45, pls. 3. Price 10 cents.

This bulletin contains descriptions of several irrigation plants in market gardens near the large eastern cities, and reports of experiments with irrigation in New Jersey and Missouri; also a report on irrigation in the artesian basin of South Dakota.

Bulletin No. 157.—Water Rights on Interstate Streams. The Platte River and Tributaries. By Elwood Mead, R. P. Teele, and Richard T. Ely. In press.

The Platte River and its tributaries lie within three States—Colorado, Wyoming, and Nebraska. The one source of supply is, therefore, subject to the laws of three States. This report is a discussion of the rights to water from this source of supply, as they have arisen under the laws and physical conditions in the three States. Doctor Mead has written a general discussion of water laws, Mr. Teele has given the results of the field work, and Doctor Ely discusses the Economics of Irrigation, drawing on the field reports for illustrations.

Bulletin No. 158.—Annual Report of Irrigation and Drainage Investigations, under the direction of Elwood Mead, Chief of Irrigation and Drainage Investigations, Office of Experiment Stations, containing reports as follows: Summary by Elwood Mead and R. P. Teele; Irrigation in Santa Clara Valley, Cal., by S. Fortier; The Distribution and Use of Water in Modesto and Turlock Irrigation Districts, Cal., by Frank Adams; The Relation of Irrigation to the Yield, Size, Quality, and Commercial Suitability of Fruits, by E. J. Wickson; Irrigation Conditions in Imperial Valley, Cal., by J. E. Roadhouse; Mechanical Tests of Pumping Plants used for Irrigation, by J. N. Le Conte; Irrigation in Klamath County, Oreg., by F. L. Kent; Irrigation Investigations in Yakima Valley, Wash., 1904, by O. L. Waller; Irrigation Conditions in Raft River Water District, Idaho, in 1904, by W. F. Bartlett; Report of Irrigation Investigations at New Mexico Agricultural Experiment Station, Mesilla Park, for the Season of 1904, by J. J. Vernon; Irrigation Investigations in Western Texas, by Harvey Culbertson; Pumping Plants in Texas, by C. E. Tait; Irrigation in Southern Texas, by A. J. Bowie; Rice Irrigation in Louisiana and Texas in 1903 and 1904, by W. B. Gregory; Rice Irrigation on the Prairie Lands of Arkansas, by C. E. Tait; Irrigation Experiments at Fort Hays, Kans., by J. G. Haney; Irrigation at Garden City, Kans., by A. B. Collins and A. E. Wright; Pumping Plants in Colorado, Nebraska, and Kansas, by O. V. P. Stout; Irrigation near Rockyford, Colo., by A. E. Wright; The Irrigation and Drainage of Cranberry Marshes in Wisconsin, by A. R. Whitson; and Report of Drainage Investigations, 1904, by C. G. Elliott.

This is the general report of Irrigation and Drainage Investigations in 1904.

## PUBLICATIONS NO LONGER AVAILABLE.

## BULLETINS.

Bulletin No. 36.—Notes on Irrigation in Connecticut and New Jersey. By C. S. Phelps, B. S., and Edward B. Voorhees, M. A. Pp. 64, figs. 7. Price 5 cents.

This bulletin discusses the need, methods, and history of irrigation in Connecticut, irrigation plants in use in Connecticut, experiments on the effects of irrigation on strawberries, and suggestions regarding irrigation; the need of irrigation in New Jersey; amount of water necessary, storage of water, seepage, cost of irrigation, areas capable of being watered by gravity, irrigation by pumping, irrigation by wells, warping, water meadows, total area irrigable, estimated cost of irrigation and suggestions for small plants, use of irrigation in New Jersey, possibility of pumping large quantities of water from wells for irrigating purposes, and irrigation experiments in New Jersey.

Bulletin No. 58.—Water Rights on the Missouri River and Its Tributaries. By Elwood Mead, State Engineer of Wyoming. With papers on the Water Laws of Colorado, by John E. Field, State Engineer; and of Nebraska, by J. M. Wilson, State Engineer. Pp. 80, maps 3, figs. 4. Price 10 cents.

A discussion of the irrigation laws which control the diversion and use of water from the Missouri River and its tributaries. The region covered in this discussion includes Colorado, Kansas, Montana, Nebraska, North Dakota, South Dakota, Wyoming, and the Northwest Territories of Canada.

Bulletin No. 73.—Irrigation in the Rocky Mountain States. By J. C. Ulrich. Pp. 64, pls. 10. Price 10 cents.

Explains the agricultural conditions prevailing and the methods of acquiring and using water for irrigation practiced in that portion of the arid region covered more particularly by the States of Colorado, Wyoming, Utah, Idaho, and Montana, in which the conditions and methods are somewhat similar.

Bulletin No. 81.—The Use of Water in Irrigation in Wyoming and Its Relation to the Ownership and Distribution of the Natural Supply. By B. C. Buffum, M. S., Professor of Agriculture and Horticulture, University of Wyoming, and Vice-Director of Wyoming Agricultural Experiment Station. Pp. 56, pls. 8. Price 10 cents.

This bulletin reports experiments on the duty of water for different crops in Wyoming, and discusses the application and measurement of water, conditions affecting duty, and continuous flow as a basis of appropriation.

Bulletin No. 86.—The Use of Water in Irrigation. Report of Investigations made in 1899, under the supervision of Elwood Mead, Expert in Charge, and C. T. Johnston, Assistant. Including a Discussion of Investigations, by Elwood Mead; Computation of Discharge Records and Preparation of Diagrams, by C. T. Johnston, and reports by Special Agents and Observers, as follows: Use of Water in Irrigation in the Pecos Valley, N. Mex., by W. M. Reed; Use of Water in Irrigation in Arizona, by W. H. Code; Duty of Water under Gage Canal, Riverside, Cal., by W. Irving; Duty of Water in Nebraska, by O. V. P. Stout; Duty of Water under the Amity Canal, by T. Berry; Duty of Water in Wyoming, by C. T. Johnston; Duty of Water in the Gallatin Valley, Mont., by S. Fortier; Duty of Water on Big Cottonwood Creek, Utah, by R. C. Gemmell; Duty of Water Under the Logan and Richmond Canal, Utah, by G. L. Swendsen; and Duty of Water as Related to the Irrigation Problems of the Boise Valley, Idaho, by D. W. Ross. Pp. 263, pls. 50, figs. 18. Price 30 cents.

This bulletin explains the methods in use in the arid States in the distribu-

tion and use of water in irrigation. It gives a large number of measurements made to determine the duty of water and the losses by seepage and evaporation from canals, and discusses the methods by which the water supply may be more effectively and economically utilized in the production of crops. Separates of the different articles of this bulletin have been reprinted and are available for distribution.

Bulletin No. 87.—Irrigation in New Jersey. By Edward B. Voorhees, M. A., Director New Jersey Agricultural Experiment Stations and Professor of Agriculture, Rutgers College. Pp. 40, figs. 5. Price 5 cents.

Results of experiments conducted for the purpose of determining whether irrigation during short periods of drought in regions where the rainfall is usually sufficient for the maximum growth of crops will sufficiently increase the yield to pay for the works necessary to obtain the supply of water.

Bulletin No. 90.—Irrigation in Hawaii. By Walter Maxwell, Ph. D., Director and Chief Chemist, Hawaiian Experiment Station. Pp. 48, pls. 6, figs. 3. Price 10 cents.

Discusses the climatic, soil, and other conditions as affecting irrigation in Hawaii, and gives the results of irrigation experiments, especially with sugar cane, carried on by the author for a number of years.

Bulletin No. 104.—Report of Irrigation Investigations for 1900, under the supervision of Elwood Mead, Expert in Charge of Irrigation Investigations. Including a Review of Investigations, by Elwood Mead; Discussion of Investigations, by C. T. Johnston, and reports of Special Agents and Observers, as follows: Irrigation Along Pecos River and Its Tributaries, by W. M. Reed; Irrigation in the Salt River Valley, by W. H. Code; Irrigation at the Arizona Experiment Station Farm, by A. J. McClatchie; Duty of Water under Gage Canal, Riverside Cal., 1900, by W. Irving; Irrigation Investigations in Nevada, by J. M. Wilson; Water Administration in Utah, and Duty of Water on Big Cottonwood Creek, 1900, by R. C. Gemmell; Irrigation under Canals from Logan River, by George L. Swendsen; Irrigation under the Great Eastern Canal, Platte County, Nebr., by O. V. P. Stout; The Use of Water for Irrigation at Wheatland, Wyo., by C. T. Johnston; Duty of Water on the Laramie Plains, 1899, by W. H. Fairfield; Duty of Water in Idaho, by D. W. Ross; Use of Water in Irrigation in the Yakima Valley, by O. L. Waller; Irrigation Investigations in Montana, 1900, by Samuel Fortier; and Progress Report on Silt Measurements, by J. C. Nagle. Pp. 334, pls. 25, figs. 29. Price 50 cents.

This report covers the second year of investigations relating especially to the duty of water. The reports of the field agents contain also a large amount of information on laws and customs, agricultural methods, crop returns, and other subjects related to irrigation. A progress report on the quantities of silt carried by a number of southern rivers, is also contained in this volume. The report has been reprinted in separates, which are available for distribution.

Bulletin No. 105.—Irrigation in the United States. Testimony of Elwood Mead, Irrigation Expert in Charge, before the United States Industrial Commission, June 11 and 12, 1901. Pp. 47, pls. 12, fig. 1. Price 15 cents.

The statement made before the Industrial Commission deals chiefly with the legal status of irrigation, touching on State control, national aid to irrigation, and the disposal of the public grazing lands. The necessity and possibility of storage are also discussed.

Bulletin No. 108.—Irrigation Practice Among Fruit Growers on the Pacific Coast. By E. J. Wickson, M. A., Professor of Agricultural

Practice, University of California, and Horticulturist of the California Agricultural Experiment Station. Pp. 54, pls. 10, figs. 7. Price 15 cents.

This bulletin gives the results of a special investigation into the conditions, extent, and methods of irrigation as practiced among fruit growers on the Pacific coast.

Bulletin No. 113.—Irrigation of Rice in the United States. By Frank Bond and George H. Keeney, Agents and Experts, Irrigation Investigations, under the direction of Elwood Mead, Expert in Charge of Irrigation Investigations. Pp. 77, pls. 28, figs. 10. Price 30 cents.

In this bulletin Mr. Bond describes the rice industry of Louisiana and Texas and gives measurements of the quantities of water used in irrigating rice. The laws relating to irrigation of the two States dealt with are also discussed. Mr. Keeney's report covers North Carolina, South Carolina, and Georgia, and is almost wholly descriptive.

Bulletin No. 119.—Report of Irrigation Investigations for 1901, under the direction of Elwood Mead, Chief of Irrigation Investigations. Containing Summary of Results, by R. P. Teele, and reports by Special Agents and Observers as follows: Irrigation in New Mexico, by W. M. Reed; Irrigation Investigations in the Salt River Valley for 1901, by W. H. Code; Irrigation at the Arizona Experiment Station Farm, by A. J. McClatchie; Studies of the Subterranean Water Supply of the San Bernardino Valley and Its Utilization, by E. W. Hilgard; Duty of Water under Gage Canal, Riverside, Cal., 1901, by W. Irving; Duty of Water in Tule River Basin, California, by A. E. Chandler; The Use of Water in Irrigation in Washington for the Season of 1901, by O. L. Waller; The Distribution of Water from Canals in Idaho, by D. W. Ross; Irrigation Investigations in Montana, 1901, by Samuel Fortier; Irrigation in Bear River Valley, Utah, 1901; Irrigation in the Grand Valley, Colorado, 1901, and Irrigation in the Arkansas Valley, Colorado, by Arthur P. Stover; Irrigation Under the Great Eastern Canal, Platte County, Nebr., in 1901, by O. V. P. Stout; Irrigation Experiments at the Missouri Experiment Station, by H. J. Waters; Irrigation Experiments in Wisconsin, by F. H. King; Irrigation in New Jersey, by E. B. Voorhees; and Second Progress Report on Silt Measurements, by J. C. Nagle. Pp. 401, pls. 64, figs. 12. Price 50 cents.

This is the third of the annual reports of the Irrigation Investigations of this Office. It deals chiefly with the duty of water, but contains also reports from four stations in the humid States, where irrigation is not a necessity, but a means of increasing the returns from farm lands; a report on the underground water supply of the San Bernardino Valley, California, and the second progress report on silt measurements. This report has been reprinted in four parts in the form of separates, which are available for distribution.

Bulletin No. 133.—Report of Irrigation Investigations for 1902, under the direction of Elwood Mead, Chief of Irrigation Investigations, Office of Experiment Stations. Containing reports of Special Agents and Observers as follows: Irrigation in the Mountain Water District of Salt Lake County, Utah, by E. R. Morgan; The Use of Water from the Wood Rivers, Idaho, by J. D. Stannard; Irrigation Investigations on Sand Creek, Albany County, Wyo., by B. P. Fleming; Irrigation in Washington, by O. L. Waller; Irrigation Investigations in Montana, by Samuel Fortier; Irrigation Systems on Stony Creek, Cal., by W. T. Clarke and C. W. Landis; Irrigation in the Black

Hills, S. Dak., by A. B. Crane; Rice Irrigation in Louisiana and Texas, by Frank Bond; Third Progress Report on Silt Measurements, by J. C. Nagle; Irrigation Experiments at the Missouri Experiment Station, by H. J. Waters; Irrigation in Wisconsin in 1902, by A. R. Whitson; Irrigation Investigations in New Jersey, 1902, by E. B. Voorhees; and Use of Pumps for Irrigation in Hawaii, by Jared G. Smith. Pp. 265, pls. 12, figs. 16. Price 25 cents.

This bulletin gives the result of the fourth season's investigations of the problems of irrigation, the results obtained in similar investigations in previous years being reported in Bulletins 86, 104, and 119 of this Office noted above. This bulletin has been reprinted in three parts as separates, which are available for distribution.

#### FARMERS' BULLETIN.

Farmers' Bulletin No. 116.—Irrigation in Fruit Growing. By E. J. Wickson, M. A., Professor of Agricultural Practice, University of California, and Horticulturist of the California Experiment Station. Pp. 48, figs. 8.

A statement of the relations of irrigation to fruit production, and of irrigation methods as they have been demonstrated by Pacific coast experience.

#### CIRCULARS.

Circular No. 48.—What the Department of Agriculture is Doing for Irrigation. By Elwood Mead, Chief of Irrigation Investigations, Office of Experiment Stations. Pp. 4.

Circular No. 57.—Supplemental Report on Drainage in the Fresno District, California. By C. G. Elliott, Agent and Expert, Irrigation Investigations, Office of Experiment Stations. Pp. 5.

Circular No. 58.—Irrigation in the Valley of Lost River, Idaho. By Albert Eugene Wright, Agent and Expert, Irrigation Investigations, Office of Experiment Stations. Pp. 24.

#### SEPARATES.

Rise and Future of Irrigation in the United States. By Elwood Mead, Expert in Charge of Irrigation Investigations, Office of Experiment Stations. Pp. iii, 591–612, pls. 5. (Reprint from Yearbook, 1899.)

Some Typical Reservoirs in the Rocky Mountain States. By Elwood Mead, Chief of Irrigation Investigations, Office of Experiment Stations. Pp. iv, 415–430, pls. 8. (Reprint from Yearbook, 1901.)





